THE PLANT DISEASE REPORTER

Issued By

THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station — Beltsville, Maryland
Volume 33 — December 15, 1949 — Number 12

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INTERCEPTIONS OF THE GENUS HETERODERA IN FOREIGN SOIL

Willis H. Wheeler

During the past year the Bureau of Entomology and Plant Quarantine and the Bureau of Plant Industry, Soils, and Agricultural Engineering have cooperated in an effort to determine the frequency with which the golden nematode of potatoes (Heterodera rostochiensis Wr.) was coming to this country in soil from foreign countries. Samples of foreign soil intercepted by the Bureau of Entomology and Plant Quarantine have been submitted first to its golden nematode laboratory at Hicksville, Long Island, New York. All cyst-forming nematodes found are tentatively identified at that laboratory and then forwarded to the Bureau of Plant Industry, Soils, and Agricultural Engineering at Beltsville, Maryland, for final determination.

Under this arrangement the first interception was made at Mobile, Alabama, on November 24, 1948, and proved to be the golden nematode. Additional interceptions of the same pest have been made in the months that followed, and several other species of the genus have been collected. All such collections are listed below.

Heterodera avenae Mortensen, Rostrup, & Kolpin Ravn
- France 1

Heterodera possibly cacti Filipjev & Schuurmans Stekhoven
- Mexico 1

Heterodera goettingiana Liebscher
- Azores 1
- Denmark 1
- Italy 1

Heterodera punctata Thorne
- England 1
- France 1

Heterodera rostochiensis Wr.
- England 9
- Germany 2
- Ireland 3
- Scotland 1

Heterodera schachtii A. Schm.
- Germany 1
- Italy 1

Heterodera sp.
- France 1

DIVISION OF FOREIGN PLANT QUARANTINES, BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, AGRICULTURAL RESEARCH ADMINISTRATION, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

PRELIMINARY TESTS WITH SEED TREATMENTS IN PROHIBITING ROOT-KNOT NEMATODE INFECTION OF CUCUMBER SEEDLINGS[1]

A. C. Tarjan and J. E. Moore[2]

Little is currently known concerning the value of various fungicides in prohibiting infection of young seedling plants by root-knot nematodes. It is thought that the period immediately following germination of seed is the most vulnerable stage in which crop plant growth and subsequent yield may be impaired. Consequently, it was thought that if seed treatments could prevent root-knot nematode infection for a few days after germination of seed, larger, more vigorous plants with a subsequent increase in yield might result.

In the following experiments, the Marketer variety of cucumber was used. The fungicides used were applied at the rate specified by the manufacturer or at 0.2 percent of the weight of the seed when not specified. All field tests were conducted on the farm of the Rayner Bros., Salisbury, Maryland, to whom appreciation is expressed at this time.

In the first test, conducted in the greenhouse in 1948, seeds were treated with Arasan, Spergon, and Semesan and planted in pots containing root-knot infested soil. After germination, 5 seedlings were carefully dug from each treatment as well as the controls on 4 successive days and stained by the lactophenol-acid fuchsin method.[3] It was found that nematode penetration of the roots began on the third day. By the fourth day, fewer nematodes were seen in the Semesan treatments than in other treatments or the controls.

The second test was conducted at Beltsville, Maryland, in a 6 x 12 foot plot to which a liberal quantity of root-knot infested soil had been added and spaded into a depth of 6 inches. All treatments shown in Table 1, as well as controls, were randomized within 5 replicate blocks. After germination of seed, 5 seedlings from each treatment were carefully dug for 3 successive days, stained in lactophenol-acid fuchsin, and the nematodes in the entire root systems were counted. All treatments having a total of 2 or less nematodes in the roots were then sampled an additional day. From the results obtained, it was decided to further test treatments 1 through 19.

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[1] The authors are indebted to Dr. G. Steiner, Principal Nematologist, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Maryland, for the suggestion of this problem.

[2] Graduate Assistant and Instructor respectively, Division of Plant Pathology, University of Maryland, College Park. Miscellaneous Publication No. A258. Contribution No. 2193 of the Maryland Agricultural Experiment Station.

[3] McBeth, C. W., A. L. Taylor, and A. L. Smith. Note on staining nematodes in root tissue. Proc. Helm. Soc. Wash. 8: 26. 1941.

Table 1. Fungicides Used

Treatment No.	Fungicide	Active Ingredient	Manufacturer
1	Semesan	30% Hydroxymercurichlorophenol	E.I. Dupont de Nemours Co.
2	Bioquin I	80% Copper 8 quinolinolate	Monsanto Chemical Co.
3	Tribasic Copper Sulfate	53% metallic copper	Tennessee Corporation
4	Phygon XL	50% Dichloronapthoquinone	U. S. Rubber Co.
5	Arasan	50% Tetramethyl thiuram-disulfide	E.I. Dupont de Nemours
6	--------	Manganese ethylene bisdithiocarbamate	E.I. Dupont de Nemours
7	Exp. Fung. 224	Zinc mercury chromate	Carbon & Carbide Corp.
8	--------	Propylene glycol dipropionate	----------
9	Ceresan M	7.7% ethyl mercury p-toluene sulfonanalide	E.I. Dupont de Nemours
10	Nuodex Comp. D-123	organo-inorganic salt containing 23.5% copper	Nuodex Corporation
11	Nuodex Comp. D-122	organic compound containing 20% mercury	Nuodex Corporation
12	Zerlate	70% Zinc dimethyldithiocarbamate	E.I. Dupont de Nemours
13	CTAB	Cetyl trimethyl ammonium bromide	J. T. Baker Chemical Co.
14	KF-114-Hg	----------	----------
15	Phygon	Dichloronapthoquinone	U. S. Rubber Co.
16	Dithane Z-78	65% Zinc ethylene bisdithiocarbamate	Rohm and Haas
17	N.I. Ceresan	5% Ethyl mercury phosphate	E.I. Dupont de Nemours
18	Mycoban	Calcium proprionate	E.I. Dupont de Nemours
19	--------	Tetra copper calcium oxychloride	----------
20	Semesan Bel	12% Hydroxymercurinitrophenol, 2% Hydroxymercurichlorophenol	E.I. Dupont de Nemours
21	Spergon	98% Tetrachloro para benzoquinone	U. S. Rubber Co.
22	Fermate	70% Ferric dimethyl dithiocarbamate	E.I. Dupont de Nemours
23	Exp. Fung. 640	Zinc copper chromate	Carbon & Carbide Corp.
24	Crag Potato Fung. 658	Copper zinc chromate	Carbon & Carbide Corp.
25	Nuodex Comp. D-124	Organo-inorganic salt containing 24% zinc	Nuodex Corporation
26	Cuprocide	Red cuprous oxide	Rohm and Haas
27	Semesan Jr.	1% Ethyl mercury phosphate	E.I. Dupont de Nemours

Experiment 3 was conducted late in the growing season of 1948 on root-knot infested land at Salisbury. This experiment was planned to determine the effect of seed treatment on plant weight after 1 month of growth. Treatments 1 through 19 were applied to lots of 100 cucumber seeds and randomized with 5 replicated blocks along with controls. One month after seeding, the seedlings were cut at ground level and the mean weight per plant for each treatment calculated. Differences observed were not statistically significant (Table 2).

Table 2. Effect of seed treatments on plant growth for one month.

Treatment no.[a]	Mean weight per plant in grams	Treatment no.[a]	Mean weight per plant in grams
1	2.80	11	2.28
2	2.72	12	1.98
3	2.72	13	1.88
4	2.54	14	1.36
5	1.95	15	1.82
6	1.93	16	2.04
7	2.07	17	1.82
8	2.23	18	2.12
9	2.37	19	1.94
10	2.50	Control	1.73

[a] See Table 1.

In the final experiment, the 4 most promising materials, namely, treatments 1 through 4, were applied to lots of 100 seeds each. Controls were also set up and the experiment was planted in a 5 x 5 Latin square in infested root-knot soil at Salisbury, during the spring of 1949. Particular care was exercised in the selection of the planting site so that the entire plot was of uniform elevation and soil texture. Although rain followed the planting of the seed permitting germination, a continued dry spell as well as relatively cool weather inhibited normal growth of the seedlings. At weekly intervals for 2 successive weeks following germination, 5 plants selected at random from each treatment in each block were carefully dug and the roots were stained as mentioned previously. Nematodes in the roots were then counted. The mean number of nematodes per plant in each treatment for the 2-week period following germination is presented in Table 3 as are counts of plant stand taken 1 week after germination. Approximately 6 weeks after germination, all rows were thinned so that plants were spaced 1 foot apart. Yield data were obtained throughout July and the means for number and weight of cucumbers per plant, and percentage of grade #1 cucumbers per row are presented in Table 3. After the last picking, 5 randomized plants from each treatment in each replication were dug and rated according to a

root-knot index.[4] The mean rating per plant in each treatment is presented in Table 3. Differences observed were not statistically significant.

Table 3. Effect of seed treatments on cucumber plants.

Treatment	Mean plant stand in percent	Mean number of nematodes in roots	Mean number of cucumbers per plant	Mean weight per cucumber in pounds	Mean percentage of grade #1 cucumbers	Mean root-knot index rating for 5 plants
Semesan	59	10.5	1.18	0.30	22.2	3.9
Bioquin I	59	16.6	0.83	0.30	26.4	4.0
Tribasic Copper Sulfate	60	25.4	1.61	0.54	57.0	3.7
Phygon XL	65	18.3	1.14	0.48	37.8	4.0
Control	58	13.4	1.01	0.54	66.0	3.9

It was generally concluded from the results of these tests that seed treatment of Marketer variety of cucumber seed was ineffective in reducing infection of seedling roots by root-knot nematode larvae or in increasing the size and quality of yield.

DIVISION OF PLANT PATHOLOGY, UNIVERSITY OF MARYLAND, COLLEGE PARK, MARYLAND AND DIVISION OF NEMATOLOGY, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, BELTSVILLE, MARYLAND, COOPERATING

[4] Chitwood, B. G. Soil treatments with volatile liquids for control of nematodes. Phytopath. 31: 818-824. 1941.

THE OCCURRENCE OF ONION SMUT IN CALIFORNIA

James B. Kendrick and E. E. Stevenson

On October 7, 1949, the junior author (Farm Advisor, Stanislaus County) found what looked to be onion smut, caused by Urocystis cepulae Frost, in a two-acre onion plant bed near Turlock, Stanislaus County, California. Examination of diseased specimens from this planting at the Division of Plant Pathology, College of Agriculture, Davis, California, confirmed the supposition that the trouble was onion smut. This disease has not previously been reported from California.

A careful examination of the affected bed on October 12 showed the disease to be generally distributed over the entire two acres, although more severe in certain localized areas. According to the grower, this plot of land had been used as an onion plant bed for the past eight years in succession. The wide distribution and severity of the disease in many localized areas left little doubt that the disease had been in the soil for some time. The planting is in a light sandy soil. No information could be secured as to the previous cropping of the land other than for general truck crop growing. The grower claims to have observed the disease on his place for many years and was of the opinion that it was widespread.

Seed of the Stockton Red and Stockton Yellow varieties were planted on beds in this field on August 25 of this year. It was evident that many of the seedling plants were killed by the disease, but there was no appreciable reduction in stand. Many plants showed heavy infection on the outer leaves and older leaf scales. The percentage of diseased plants varied from 4 to 55, with an average of 16 percent. The disease was considerably more severe in that portion of the field planted to the Stockton Yellow variety than in the area planted with Stockton Red. The general incidence of the disease indicated that this difference was due to a heavier soil infestation in the area where the Stockton Yellow variety was growing.

Since the grower stated that he had, in previous years, sold plants from this nursery in the adjoining county of San Joaquin, five plantings of comparable age in the French Camp section of San Joaquin County were examined, and no evidence of smut was found. On October 14, Mr. D. G. Milbrath, Plant Pathologist for the California State Department of Agriculture, Sacramento, reported to the senior author that three out of four onion plant beds examined in another district of San Joaquin County showed from a trace to considerable smut. One grower is reported to have abandoned some ground for onion plant beds recently because of this disease. A further survey is being conducted by Mr. Milbrath and his staff to determine the extent and distribution of onion smut in the State.

J. C. Walker and L. R. Jones[1] have given considerable attention to soil and air temperatures in relation to infection, severity, and occurrence of onion smut. They showed that a high percentage of plants grown on smutted soil were infected at soil temperatures ranging from 10° to 25°C, but a decided reduction in infection occurred at 27°C, and complete freedom from the disease at 29°C (84°F). They also showed that high air temperature alone failed to check the development of the disease. The work of Walker and Jones and others has shown that the period of susceptibility of the onion plant to smut infection usually extends from the time the seed germinates until the cotyledon attains full growth, a period of about three weeks. Walker and Jones further called attention to the fact that onion smut was not a factor in the winter commercial onion growing sections in the south and in one or more sections in the Pacific Coast States, and attribute this to climatic factors. The common practice is to seed onions in special beds in late summer in these areas when relatively high temperatures prevail and superficial desiccation occurs.

It has been assumed that the relatively high temperature prevailing in interior California during August and September, when normally most commercial onion seed is planted, prevents the occurrence of onion smut. While it is true that the daytime temperatures in the San Joaquin Valley of California are relatively high, it is also true that the night temperatures are relatively low. The maximum mean temperature for August and September is only slightly above the maximum for smut infection, and the minimum mean, as well as the average mean, is well within the range for abundant infection. The following temperature records were taken from the U. S. weather report for Stanislaus County, California. In August, 1948, the maximum mean air temperature was 88.2°F, and the minimum mean was 55.8°F, or an average mean of 72°F. September, 1948, showed a maximum mean of 85.7°F and a minimum mean of 52.1°F, or an average mean of 68.9°F. Temperatures for August, 1949, showed a maximum mean of 86.3°F and a minimum mean of 52.9°F, or an average mean of 69.6°F. Temperature records for September, 1949, are not yet available. Records from the same station for 1946 and 1947 do not differ appreciably from those for 1948 and 1949.

Under California conditions, onion plant beds are kept relatively wet from seeding until the plants are well above the soil. It is quite likely that the mean soil temperature in the surface soil is lower than the mean air temperature, owing to rapid evaporation. It is evident, from these temperature records and from the occurrence of onion smut in Stanislaus and San Joaquin Counties of California, that the daily mean temperatures are not sufficiently high to exclude smut infection where the fungus is present in the soil.

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[1] Walker, J. C. and L. R. Jones. Relation of soil temperature and other factors to onion smut infection. Jour. Agr. Res. 22: 235-262. 1921.

OBSERVATIONS ON DISEASES OF SOME SPECIAL CROPS

C. A. Thomas

CASTOR BEAN. Alternaria ricini (Yoshii) Hansford was observed fruiting on capsules of castor bean plants in August in an experimental planting at Beltsville, Maryland. Affected capsules wilted and prematurely turned brown. In some cases entire inflorescences were attacked. Seed in affected capsules was poorly filled. In a three-acre commercial planting at Odenton, Maryland, a count of 3000 capsules revealed that 21.8 percent were affected with Alternaria. A moderate amount of leaf spotting was caused by the same organism. Only a trace of gray mold, Sclerotinia ricini Godfrey, was noted.

DIGITALIS. A commercial planting of Digitalis lanata near Oley, Pennsylvania, was completely lost in 1948 because of anthracnose. The causal organism, Colletotrichum fuscum Laub., found to be seed-borne, fruits on damped-off seedlings and is easily spread in the seedbed. In 1949, selection of clean plants in a seedbed containing affected plants resulted in only fair control. Results of another test, however, indicated that anthracnose may be controlled by starting with disease-free seed and planting in areas where Digitalis has not been cultivated. D. purpurea, D. ambigua, and D. ferruginea appeared as susceptible as D. lanata when artificially inoculated in the greenhouse. In the field, however, D. purpurea and D. ambigua were relatively free from infection. D. purpurea plants left in the field during the winter for seed production were moderately spotted with anthracnose lesions in June of the second year.

At Beltsville, D. lanata was severely damaged just prior to flowering in the second year by a species of Alternaria. Both leaves and flower parts were affected and many of the plants failed to produce seed.

Rootknot was particularly troublesome on D. purpurea at Beltsville.

SAFFLOWER. A survey of the commercial safflower acreage in western Nebraska was made in August, 1949. Alternaria leaf spot was prevalent in fields in the vicinity of Scottsbluff and Alliance. In experimental plantings in regions of greater rainfall, North Platte and Lincoln, Nebraska, and Beltsville, Maryland, the disease was much more severe. Varieties Nebr. 1 and Nebr. 2, highly susceptible to leaf spot, were severely affected at both Scottsbluff and Beltsville. Other varieties such as Nebr. 6 and Nebr. 7 were relatively free from infection at Scottsbluff but were heavily spotted at Beltsville. The results of varietal susceptibility studies and seed treatment tests will appear in another publication.

Rust, caused by Puccinia carthami Corda, was prevalent in experimental plantings at Scottsbluff. Leaves of susceptible selections were completely

covered with rust pustules. Rust also was present in several commercial fields of variety Nebr. 852 in the vicinity of Scottsbluff. It appears that this disease may become increasingly important.

At Mirage Flats, near Alliance, a rot affecting nearly 50 percent of the flower buds was noted in several fields. The trouble appeared to be associated with beetle injury.

Root rot (causal agent not known) was observed in most fields in the vicinity of Scottsbluff. Claassen, Schuster, and Ray (PDR 33, No. 2, Feb. 15, 1949) have described the symptoms of this disease. The trouble was associated with over-irrigation and was most severe in low spots in the fields. Drowning of plants by excess moisture alone is considered distinct from root rot.

MINT. Verticillium wilt remains the No. 1 problem for mint growers in Indiana and Michigan. The acreage of this crop in Michigan is dropping year by year, and more oil is coming from Oregon and Washington where wilt is not encountered. At present, the only satisfactory control of wilt appears to be the development of resistant types.

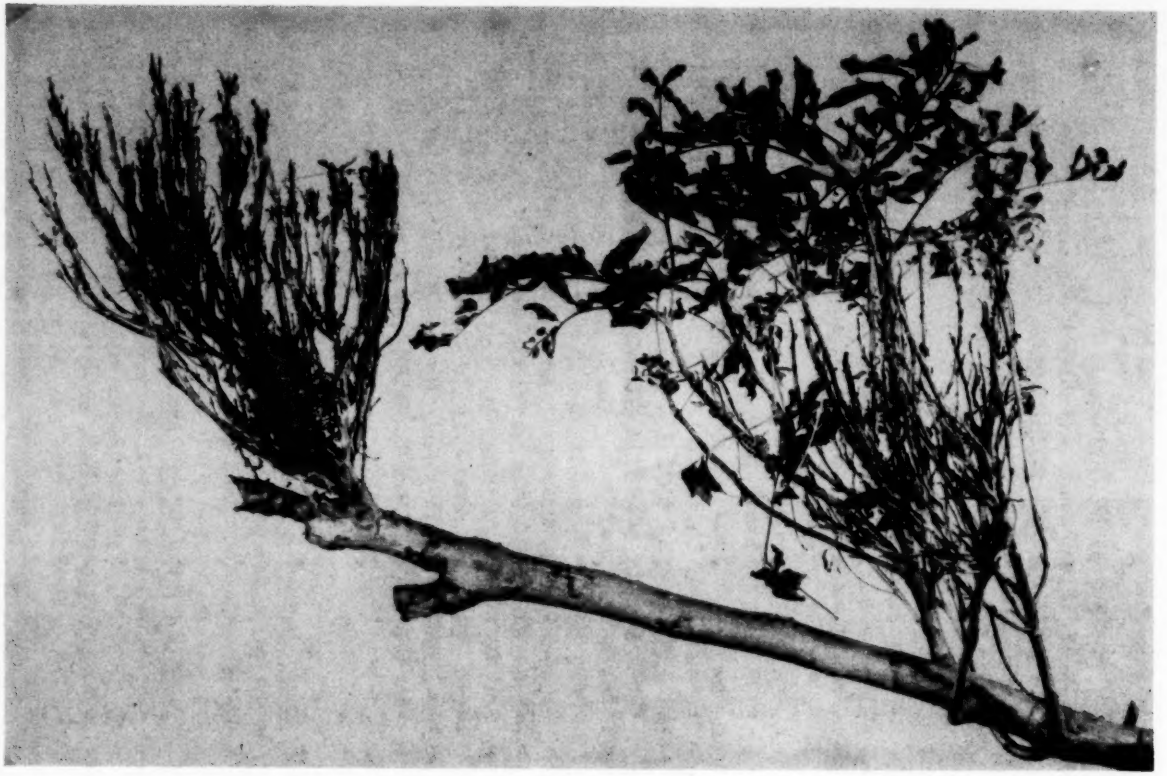
Leonard spot (Sphaceloma menthae Jenkins) was more prevalent this year than usual in Indiana and Michigan.

SUMAC. During the summer of 1948 Rhus glabra seedlings in a seedbed at Beltsville were severely affected with powdery mildew (Sphaerotheca humuli (DC.) Burr.) Over one-third of several hundred seedlings in the seedbed were killed. At the end of the season the remaining seedlings were heeled-in and they were planted in the field in the spring of 1949. Mildew appeared early in July in this planting and in a nearby seedbed about two weeks later. By August the leaves and stems of practically all of the plants were affected. Only fair control of mildew in the seedbed was obtained with Fermate (ferric dimethyl dithiocarbamate) [=ferbam, see page 486] at 2 lbs. per 100 gal. Dusting with sulphur proved very injurious. Rhus copallina and Rhus typhina were not affected with mildew.

A leaf spot caused by Cylindrosporium toxicodendri Ell. & Ev. is common at Beltsville in late summer on all species of sumac. The leaf spot is confined to lower leaves and does not appear serious.

CORIANDER. Anthracnose, Gloeosporium sp., caused serious damage to experimental plantings at Beltsville in 1948 and 1949. Infection of floral parts, which caused considerable loss in yield, and stem lesions resulted in death of the tops giving them a blighted appearance. The late maturing Russian type was more seriously affected in the field than the early maturing Moroccan type although both were highly susceptible when artificially inoculated in the greenhouse. Conidia were found to be seed-borne and to cause damping-off of young seedlings.

DIVISION OF TOBACCO, MEDICINAL, AND SPECIAL CROPS, U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING



Brooming disease of Japanese walnut in Georgia. (See page 455.)

WITCHES'-BROOM OF JAPANESE WALNUT IN GEORGIA

Julian H. Miller and G. E. Thompson

Japanese walnuts (Juglans sieboldiana) were sent to Dr. T. H. McHatton of the College of Agriculture by the Office of Plant Introduction, U. S. Department of Agriculture about 25 or 30 years ago. They were divided into three lots of about 15 trees each, and one lot was planted on the farm near a pecan grove, one about one-half mile away near the river, and the last about the same distance in a woods along a stream.

In 1938 the group planted on the farm developed brooming as shown in the illustration. In addition to the proliferation of adventitious branches and dwarfed leaves, many branches were in the mass with the appearance of abortive staminate racemes. Prior to the broom formation these trees had been normal in growth and had borne some nuts. The trees died about 1944. The other lots developed the brooms in 1947 and now every tree shows a complete systemic infection.

This month Dr. W. A. Campbell found a Japanese walnut in a private yard about two miles from the original trees. This tree was grown from a seed, probably from the trees from the Horticultural farm. It had been moved from another location in the county in 1940, and the brooms first appeared in 1947. At this writing, 1949, the entire tree is covered with brooms. Last spring a few blooms and immature fruits developed, but soon fell off.

The black walnut (Juglans nigra) and the pecan are apparently not susceptible. A large tree of the former species is in the river grove and pecans are close to the other plants, but no symptoms have developed. However, the black walnut has been cited by Hutchins and Wester (2) as a suscept to this virus disease. Dodge (1) described this disease from a Japanese walnut in the New York Botanic Garden with the same symptoms as above.

Literature cited

1. Dodge, B. O. The brooming disease of walnut. Jour. New York Bot. Gard. 48, 569: 112-114. 1947.

2. Hutchins, L. M. and H. V. Wester. Graft-transmissible brooming disease of walnut. Phytopath. 37: 11. 1947.

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ABACÁ DISEASE STUDIES: DAVAO, PHILIPPINE ISLANDS

Otto A. Reinking

On September 4 and 5, 1949, abacá disease studies were conducted in the Davao abacá region on the Philippine Islands. My time was limited, but I did have an opportunity to inspect for disease at Madaum, in the Davao River alluvial plain about 7 kilometers above Davao; in the region of the old Ohta Development Co.; the severely diseased region about Calinan, upper Calinan and Malagos, which is at an altitude of 750 to 900 feet above sea level; the Mental region; and the Dumoy-Davao City region. Three destructive diseases of abacá have been reported from the Davao region, namely bunchy top, mosaic, and vascular disease (2). Other minor diseases, such as the dry sheath rot caused by Marasmius and the stem rot caused by Helminthosporium, are also present. These diseases have been reported on by the various investigators cited. My report has drawn freely from their comments and descriptions.

During the inspection, no bunchy top was observed. Abacá mosaic was the serious trouble present in the lowland regions. I did not get up into the upland regions at altitudes of around 2000 feet where the vascular trouble was serious in past years. The trouble was not seen in the lowland areas visited. It has been reported to be due in part to a bacterium (Bacterium solanacearum) the same organism that causes the wilt of tobacco in Sumatra (13). The true Panama disease or wilt of abacá caused by Fusarium cubense [F. oxysporum f. cubense], which is also present in Central America (15), is known to be present in the upland regions (4). How serious it was could not be ascertained on this trip.

Bunchy top of abacá

Bunchy top [virus] was not found to be present in any of the commercial plantings visited. None of the Filipino plant inspectors now in this region really know the disease, and there had been no reports of its presence in recent years. An experimental planting of breeding stock from Cavite Province, at the Bago Oshiro Experiment Station of the Philippine Bureau of Plant Industry located on the old Chta Development Company plantation, showed evidence of bunchy top. An exact identification of the disease was not possible in these plants growing under rather poor conditions. Bunchy top of abacá was first observed in the Davao region in 1931. According to Calinisan (2) continuous eradication measures against bunchy top conducted by the Bureau of Plant Industry since 1931 to the date of his report (1938) saved the industry from complete ruin. Prior to eradication the disease was reported as being

widespread in certain sections. There is no question that the eradication methods used before the war were probably 100 percent effective in the Davao region, as there is now no evidence of disease. This shows that the disease can be easily controlled.

Mosaic of abacá

Mosaic of abacá is now the most serious threat to the industry in Davao. It was first reported in 1936. In the years during and after the war the disease evidently has been spread, primarily, I believe, by planting diseased material. In sections, the disease is present to the extent of 100 percent. Scattered spots of disease were observed at Madaum, Davao. At least 60 percent disease was noted in new plantings in the alluvial plain area about 7 kilometers out of Davao in the Tigato region. Older plantings had some 2 to 3 percent disease. The worst area of 100 percent infection in new plantings visited was located in the Calinan area southwest of Davao city. A newly planted area, estimated to extend 7 to 10 kilometers along the road and 2 kilometers deep on each side of the road, had 100 percent disease. It appeared that the disease had been spread primarily by planting diseased material. Mosaic also was present in the old Ohta Development Company, the Mental area and in the Dumoy-Davao region. The Bureau of Plant Industry has started a campaign to eradicate and control the disease (16). A short description of symptoms, cause, and control follows. In the preparation of this part of the report I have drawn freely from the writings of the investigators cited.

Symptoms. Mosaic of abacá has symptoms which are very distinct from those characteristic of bunchy top, and cannot be mistaken for this disease. The characteristic mottling in the foliage, midribs, petioles, pseudostems, inflorescences and fruits makes it easy to recognize (3). This disease resembles the infectious chlorosis, or mosaic, of bananas in Australia (8, 9), but apparently it is different, since in the Philippine Islands it has not been observed on bananas.

On leaf blade: Distinct pale yellow striping between a more normal darker green striping is present from edge of leaf blade to mid-rib of older leaves. In advanced stages the streaking may have a rusty appearance. The leaf blade may be crinkled or corrugated. On young, rolled-up leaves, bands of yellowish streaks between normal green may be characteristic. A more pronounced mottling may be present. A slight vein clearing of main lateral veins on leaf blade may be present.

On mid-rib and petioles: A distinct mottling of light yellow with darker green patches is produced on petioles and up mid-ribs. Dark green streaks with a yellowish background may run up the mid-rib. In later stages these streaks may become yellowish to orange. The tissue under these older streaks is discolored.

On stalk or pseudostem: A yellowish white to purplish streak or mottling is present in advanced cases and is especially evident on the second leaf sheath if the outer leaf sheath is removed. Necrotic brown spots are produced in vascular bundles.

On inflorescence or "heart": Yellowish light green mottling or streaks spreading from the base to the tip of the bracts are produced. Discolored scars are present on flower stem or rachis where infected bract is removed. Brownish discoloration is present in tissue below the scars.

On fruit: Violet wedge-shaped streaks or mottling are present on the fruit. The inner tissue of diseased fruit is brown.

Cause and method of transmission. Mosaic of abacá is probably caused by a virus classified as one of the cucumber viruses related to Marmor cucumeris Holmes (5).

The disease is spread by four different aphids all of which are not at home on the abacá plant. They have different preferential hosts, but may migrate to abacá and spread disease. The following aphids have been shown capable of transmitting abacá mosaic (5, 6, 10): Aphis gossypii Glover (the cotton aphid); Rhopalosiphum nymphae (Linné) and Rhopalosiphum sp. probably R. prunifoliae Fitch (grass aphids); and Aphis maidis Fitch (corn aphid). The latter can transmit abacá mosaic to corn and from corn to abacá. None of the four aphids prefer abacá as a host but are merely casual migrants. They apparently are the only means of insect spread of mosaic and, according to my field observations, apparently are more of a factor in spread especially in regions where the disease is present to an extent of 50 percent or more. The earliest symptoms of mosaic appear 8 to 10 days after inoculation by aphids. The bunchy top aphis, Pentalonia nigronervosa Coq., cannot transmit the abacá mosaic virus (12).

The virus of abacá mosaic belongs to the non-persistent viruses. They require no incubation period in the vector, are not long retained by the vectors after the latter leave a diseased plant, are usually transmissible by mechanical means and most of these viruses can be transmitted by several species of insects (7). These factors have a bearing on control as do the following factors (5, 10):

1. The virus is systemic, that is, it spreads throughout the plant and stool.
2. Rootstocks or suckers from mosaic-infected mother plants or stools almost invariably produce mosaiced abacá when planted.
3. Not all plants in affected stools may show symptoms, but it is not advisable to use healthy-appearing plants from these stools for planting material.
4. No cases of recovery have been noted in field or greenhouse.

5. Diseased plants may die a premature death or continue to grow until the fruiting stage is reached. They usually continue on for 8 months, then become stunted.

6. So far as is known the virus is not carried in the seed.

7. Diseased stalks when mature are strippable, but it is not known whether the strength of the fiber is affected.

8. The varieties Tangongon, Maguindanao, and Bongolanon are all subject to mosaic. No resistant varieties are known.

9. The virus does not live in the soil.

10. The virus is not transmitted from diseased to healthy plants by knives or implements.

11. As far as is known the disease does not affect bananas in the Philippines. The vector, Pentalonia nigronervosa, of bunchy top failed to transmit mosaic.

Possible other plant hosts of abacá mosaic. Canna indica Linn., a non-edible wild species, is affected with a mosaic with symptoms that resemble abacá mosaic. Diseased plants are found adjoining badly affected abacá plants. Canna indica mosaic virus has been transmitted to abacá by Aphis gossypii Glover and Aphis maidis Fitch. The mosaic of abacá has not been transmitted to Canna. Even though it is not definitely known whether Canna indica mosaic is identical with abacá mosaic it is a source of inoculum for infecting abacá with mosaic disease (11). Both plants apparently are attacked by the same or closely related viruses.

Aphis maidis Fitch can transmit corn mosaic to abacá and from abacá to corn. It can recover the abacá-mosaic virus from the infected corn plants and transmit it back to abacá and to corn plants (6).

It is reported that arrow root (Maranthaceae) is a host (16).

Grasses as host for vectors. A species of Rhopalosiphum (near prunifoliae) and Rhopalosiphum nympheae collected from grasses can transmit abacá mosaic from diseased to healthy abacá (5, 6).

Control. The disease is spread by aphis vectors and by transplanting diseased plants.

The aphids cannot be satisfactorily controlled so the control of disease spread will have to be based on the following:

1. Elimination of the weed hosts, in the vicinity of plantation, that carry mosaic and the insect carriers that are present on them.

2. Natural hosts of Aphis gossypii such as Canna indica, cotton, tomato and melon should not be allowed to grow in the plantation.

3. Corn should not be interplanted with, or planted near, abacá.

4. Practice clean culture to keep weeds under control. This can be

accomplished by the production of vigorous abacá plants by proper management. One way to eliminate weeds is to plant at distance of 2.5x2.5 or 3x3 meters.

5. Disease-free plantations should be protected especially, by avoiding the introduction of diseased planting material.

6. If the percentage of disease in a planting is low all diseased plants should be dug up at once and burned or destroyed at the place of digging. Grasses and other plants and the soil about the diseased plant should be sprayed with a nicotine and soap solution to kill any aphids and prevent them from spreading disease.

7. In cases where 60 to 100 percent infection occurs, exclusionary and eradicatory measures must be practiced. All diseased plants must be eradicated and the area replanted with 100 percent disease-free material. It may be necessary under certain conditions to establish nurseries for the production of disease-free planting material.

General comments on observations. My observations in the badly diseased areas of the Davao region indicate that most of the disease has been introduced by planting diseased planting material. This seems to be true because new plantings had 100 percent disease while the old adjacent plantings had only a low percentage of disease. Also, where known disease-free planting material selected by plant inspectors was used, no disease appeared. This was true even when these plantings closely adjoined 100 percent diseased plantings. The disease is held in check apparently easily by eradication of diseased plants as they are found. The disease was kept to a minimum or was not present in all well managed plantations where clean culture and roguing of diseased plants were practised, even though these plantings were in the vicinity of heavily-mosaic infected areas. While the abacá mosaic is not quite so severe in its distruction as bunchy top of abacá, it appears to be more difficult of control. This may be due in part to the weed hosts that appear at least to be a factor in spread when the disease once has obtained a foothold, and to the presence of more than one insect vector to transmit the virus.

A practice of cutting-out only individual plants in a stool that has shown disease is in vogue. This would seem to be a poor practice in plantations with only a few spots of disease. Complete eradication of the stool in which a diseased plant is found would, under these conditions, seem to be preferable. If only a low percentage of disease is present, it would seem to be good practice to eliminate it.

Experimental tests with the use of weed killers, Ammate and 2,4-D, were underway. Diseased stools and individual diseased plants in a stool were being treated in experimental tests. Fair results were obtained in the preliminary tests.

Miscellaneous diseases of abacá.

Dry sheath-rot of abacá caused by Marasmius (14). Diseased plants are pale and stunted. On the stem of inner exposed leaf sheaths the affected portions turn dark brown and appear water-soaked. In the field the mycelium of the fungus penetrates through the outer leaf sheaths, binding them together. On and between the dead leaf sheaths, layers and patches of white mycelium develop. Generally, premature death of the affected plants takes place. Under favorable conditions, numerous fruiting bodies of the Marasmius develop on badly affected stems.

The disease was observed in a plantation located at Dumoy, Davao City. A high water table from 1 to 3 feet below the ground surface made the planting subject to a disease of this type. The damp conditions were favorable to the development of the fungus, which primarily lives in the soil and attacks weakened rhizomes and pseudostems. The disease is most prevalent in low, wet spots of poorly drained lands that produce weakened plants and favorable conditions for development of the fungus. The affected plants were all of the Tangongon variety of abacá.

Stem-rot of abaca. Helminthosporium torulosum (1). The stem-rot of abacá was studied in the same plantation at Dumoy, Davao City, that has plants diseased with the Marasmius dry sheath rot. Plants affected with Helminthosporium stem rot are stunted. Black sunken areas covered with a grayish growth of spores are produced on the affected pseudostems. The diseased areas are more distinct on the leaf sheath below the outside sheath. The disease was only serious in low, poorly drained areas on which weakened plants were produced and moisture conditions were favorable to the development of the fungus. Affected plants were all of the Tangongon variety.

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NEW YORK STATE AGRICULTURAL EXPERIMENT STATION, GENEVA

AN EPIDEMIC VASCULAR WILT DISEASE OF BARILLO, CALOPHYLLUM BRASILIENSE VAR. REKOI, IN EL SALVADOR[1]

Bowen S. Crandall[2]

For some time it has appeared that epidemic tree diseases, of introduced origin, were confined to the temperate zones of the Western Hemisphere. Within a generation, North American chestnuts,[3] elms,[4] chinkapins,[5] persimmons,[6] sycamores and planetrees,[7] and mimosas[8] have been attacked and devastated by fungus diseases either of known foreign origin or whose behavior strongly suggests such origin. However, the Central American barillo, Calophyllum brasiliense var. rekoi, is now being attacked by an epidemic vascular wilt disease.

The barillo belongs to the family Guttiferae. The variety rekoi is reported to range from Mexico to Panama and the species brasiliense to Brazil. Other Central American species are C. calaba and C. lucidum. The wood of the variety rekoi is typically cream to pink in color, turning dark quickly on exposure to air. The tree is prized for its wood, used in construction work, and in El Salvador can be cut only after local authorities have issued a permit. It is also widely used as a shade and street tree, being symmetrical in shape and evergreen. Largest specimens examined were 24 inches D. B. H. and 75 feet in height.

In late May 1949, the Ministry of Agriculture of El Salvador received a request from local authorities of San Pedro Nonualco to investigate heavy losses of the barillo occurring in that region. In response to this request, the writer and Salvadorian technicians of the Centro Nacional de Agronomía visited the area. In a small valley in the montañas south of the Volcano San Vincente, where the disease was studied, it was found that about 300 trees out of a population of some

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1 A contribution from the Centro Nacional de Agronomia, a technical agricultural service organization for El Salvador, operated jointly by the Office of Foreign Agricultural Relations, U. S. Dept. of Agriculture, and by the Ministry of Agriculture of El Salvador. The funds supporting this work were provided by the U. S. Interdepartmental Committee on Scientific and Cultural Cooperation and by the Republic of El Salvador.

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3 Endothia parasitica, causing blight of Castanea dentata.

4 Ceratostomella ulmi, causing Dutch elm disease of Ulmus americana.

5 Phytophthora cinnamomi, causing root rot of Castanea ozarkensis.

6 Cephalosporium diospyri, causing wilt of Diospyros virginiana.

7 Ceratostomella fimbriata, causing canker stain of Platanus occidentalis and P. acerifolia.

8 Fusarium oxysporum f. perniciosum, causing wilt of Albizzia julibrissin.

500 were either dying or dead. Local residents stated that the disease was first noticed only two or three months prior to the report to the Ministry. Subsequent inquiry indicated that the barillo has been reported dying, from unknown causes, in widely separated localities of the Republic for the past two years. Owing to the depleted condition of the forests of El Salvador, stands of timber are seldom continuous in extent, rather being located, as was the stand examined, on limited areas unsuited to agriculture.

The disease of the barillo is typically a fast killing vascular wilt, affecting all age trees and producing comparable symptoms in approximately the same length of time regardless of the size of the tree. The first foliage symptom observed is a wilting branch or top, strikingly evident as a cluster of brown leaves standing out against the bright green foliage. Within four weeks the foliage has become chlorotic and then dry and brown. The dried leaves persist for some weeks before falling, making it easy to spot diseased trees in forest stands of mixed species.

Internally the symptoms of the disease are a dark brown streaking in the vascular system of the normally light cream colored wood. This streaking has been observed in the outer two or three growth rings and at the time wilt occurred is present throughout the trunk, branches, and roots. This streaking is apparently due to the formation of a wound gum, which plugs the vessels. Gum production in the trees is normally abundant following wounding, and this gum is sometimes collected and used locally as an astringent.

Chips from streaked portions of the trunk of diseased trees were placed in plates of Difco cornmeal and potato dextrose agar. In a high percentage of the cultures a single fungus, a species of Cephalosporium, similar to Cephalosporium diospyri but apparently an undescribed species, grew from the sections. This fungus, on all artificial media used, is pale yellow in color and appressed and slow growing, and produces in abundance spore heads on short stalks developing directly from the hyphae. These heads break up readily in air or water.

Sporulation in nature has not yet been observed but sporulation was abundant on ax chips from diseased trees placed in damp chambers in the laboratory. Spore heads resembling crude granulated sugar were produced on a very thin hyphal growth on the surface of the wood.

Spores produced in pure culture were atomized into knife wounds in small trees ranging in age from one to four years. Wilting and typical internal symptoms were produced five weeks after inoculation, indicating that observations and reports of the rather unusual speed with which trees died are substantially correct.

No clues as to the origin of the parasite have been found. Apparently no similar Cephalosporium has been described in the Americas or abroad,

and no similar disease on this or closely related species has been reported. The origin of the parasite, either in this hemisphere, or foreign as its behavior strongly suggests remains unknown, at least for the time being.

There is little possibility of combatting the disease. It has been recommended that free cutting of the tree be permitted as soon as wilt symptoms appear in any locality where the disease is present, with the restriction that chips, stump, and branches be destroyed. It is hoped that the acute need for timber will result in quick cutting of diseased trees and to some extent, at least, slow down the spread. The tree is being dropped from the reforestation program, with the expected result that it will gradually disappear from the combined effects of disease and no replacement.

CENTRO NACIONAL DE AGRONOMÍA SANTA TECLA, EL SALVADOR, C. A.

PECAN SCAB SPRAY EXPERIMENTS IN SOUTH CAROLINA DURING 1948 [1,2]

H. H. Foster, A. M. Musser, R. J. Higdon, and M. B. Hughes

Pecan scab, caused by Cladosporium effusum, is one of the limiting factors in profitable commercial production of scab-susceptible varieties of pecans in South Carolina. In recent years sales from pecans grown in this State have approached $1,000,000. For several years South Carolina has rated sixth place, among Southern States, in the production of improved pecan varieties.

This paper summarizes 1948 spray experiments conducted to ascertain the relative value of certain fungicides in the control of the scab disease under South Carolina conditions.

Methods and Materials

Spray plots were set up in two counties: (1) Near Orangeburg, in Orangeburg County, and (2) at the Edisto Experiment Station, in Barnwell County. In the Orangeburg plots the grower's power spray equipment was used, while at the Edisto Station a man experienced in custom spraying was engaged to do the spraying.

On the Orangeburg plots the following fungicides were used: (1) Bordeaux Mixture applied as a 4-1-100 formulation for the first spray and as a 6-2-100 in the later sprays; (2) Copper-A (3-100); (3) Zerlate (zinc dimethyl dithiocarbamate) [=ziram, see p. 486] (2-100); (4) Parzate (zinc ethylene bisdithiocarbamate) [=zineb, see p.](2-100); and (5) a Cu-Zn compound, mixed for pecan spraying (5-100). At the Edisto Station three materials were used: (1) Bordeaux mixture, (2) Zerlate, and (3) Karbam White (zinc dimethyl dithiocarbamate) [ziram] (2-100). Unsprayed (control) trees were included at both locations.

Sprays were applied four times during the season. The first application was made between April 16 and May 1, and preceded pollination, while the remaining three applications were made at successive intervals of approximately 30 days. In addition, DDT (2# of a 50% dust) was added to the last spray application at Orangeburg. At the Edisto Station two similar applications of DDT were made: (1) with the final fungicide spray, and (2) a few weeks later during August.

Examination of unhulled nuts for scab was made during the first week of September. The scab classification used in this experiment was

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[1] The writers wish to express their appreciation for helpful suggestions from Dr. J. R. Cole of the U. S. Pecan Station at Albany, Georgia, during the progress of these experiments.

[2] Acknowledgement is made to E. I. du Pont de Nemours and Co., Inc.; Niagara Sprayer and Chemical Division, Food Machinery Corp.; and Tennessee Corporation for furnishing certain experimental spray materials used at the Orangeburg plots.

Table 1. Effect of spray program on scab of Schley pecans at the Orangeburg plots

Treatment	Number of trees sprayed each treatment	Number of nuts counted	Percent infection per class[a]				
			1	2	3	4	5
None	7	1362	0	1.1	0.7	20.9	77.1
Bordeaux Mixture	14	1711	56.2	42.0	0.8	0.8	0.1
Copper-A	13	1566	60.2	36.7	1.4	1.1	0.3
Zerlate	15	1852	69.0	30.2	0.3	0.4	0.0
Parzate	13	1765	56.6	25.3	2.7	12.4	2.8
Bordeaux 1st+4th spray:							
Tenn. Cu-Zn compound							
2nd+3rd spray	8	781	5.2	42.1	31.4	19.5	1.5
1st spray omitted							
Tenn. Cu-Zn compound							
2nd+3rd spray							
Bordeaux 4th spray	6	588	1.5	21.4	51.0	22.9	3.0

Table 2. Effect of spray program on scab of Schley pecans at the Edisto Experiment Station plots

Treatment	Number of trees in each group	Number of nuts counted	Percent infection per class[a]				
			1	2	3	4	5
None	5	728	0	0	0	0.4	99.5
Bordeaux Mixture	9	925	15.3	29.9	25.0	25.9	3.6
Zerlate	6	527	0	0	0	3.9	96.0
1st spray omitted							
3 following sprays							
with Karbam White	2	252	0.3	6.7	19.0	43.6	30.1

[a] Empirical pecan classification suggested by Dr. J. R. Cole, Pecan Station, (U. S. D. A.), Albany, Georgia:

1--No infection on shuck
2--1-3 initial infections on shuck
3--4 or more initial infections on shuck
4--Few secondary infections on shuck
5--Numerous secondary infections on shuck

Table 3. Number of pecans per pound from the Orangeburg plots

Treatments	Number of trees sampled	Number of lots weighed	Number of pecans weighed	Average number of pecans per pound
None	6	16	2038	127.3
Bordeaux	8	21	2580	122.8
Copper-A	8	21	2419	115.1
Zerlate	8	21	2224	105.4
Parzate	8	19	2129	112.0
Bordeaux 1st+4th Tenn. Cu-Zn 2nd+3rd	5	10	1288	128.8
1st Spray Omitted 2nd+3rd Cu-Zn 4th Bordeaux	4	9	1164	129.3

Table 4. Number of pecansper pound from the Edisto Experiment Station plots

Treatments	Number of trees sampled	Average number of pecans per pound
None	3	86.0
Bordeaux	10	69.5
Zerlate	11	83.9
Karbam White	4	72.0

suggested by Dr. J. R. Cole, Pecan Station, Albany, Georgia (see footnote, Table 1). In addition the effect of each treatment on the number of nuts per pound was ascertained from random samples collected from representative trees.

Experimental Results

Scab Data. Infection of pecan nuts by the scab fungus at Orangeburg is shown in Table 1. None of the sprayed trees produced more than 3 percent severely scabbed nuts, whereas the examination of nuts from unsprayed trees showed that 77 percent fell in class 5, severely scabbed. The unsprayed trees failed to produce any nuts entirely free from scab

symptoms. At Orangeburg, Zerlate was the best treatment, with 69 percent of the nuts in class 1, free from scab. Zerlate was followed by Copper-A, Parzate, and Bordeaux Mixture with 60.2 percent, 56.6 percent, and 56.2 percent of the nuts, respectively, in class 1. The Cu-Zn compound appeared to be the least effective of the fungicides tested. Under this treatment a high percentage of the nuts were in classes 2 and 3. All nuts were of small size at the Orangeburg plots owing, at least in part, to the limited rainfall during the summer months. The total rainfall, from April 1 to August 31, at the Edisto Station was 28.3 inches and at the Orangeburg plots only 17.19 inches. The monthly average of rainfall for the five months at the Edisto Station and Orangeburg plots was 5.66 inches and 3.43 inches, respectively.

Data from the Edisto plots are shown in Table 2. Scab was more severe at the Edisto Station than at Orangeburg. Ninety-nine and one-half percent of the nuts from unsprayed trees were in class 5, severely scabbed. Zerlate, at the Edisto Station, failed to control scab, since 96 percent of the nuts under this treatment were in class 5. Karbam White, with the first spray omitted, showed 30.1 percent of the nuts in class 5. Bordeaux Mixture, the only effective treatment, resulted in only 3.6 percent of the nuts falling in class 5. Only 15.3 percent of the Bordeaux-sprayed nuts were in class 1, "free from scab symptoms"; however, most of the Bordeaux-sprayed nuts contained well filled "kernels".

Effect of Fungicides on Nut Size. The average number of pecans per pound for each treatment at the Orangeburg plots is shown in Table 3. Zerlate was the best treatment at this location with 105 nuts per pound, followed by Parzate with 112, and Copper-A with 115. The remaining treatments indicated no important difference in the number of nuts per pound.

At the Edisto Station nuts from the Bordeaux-sprayed trees were larger than nuts from the Karbam White- and Zerlate-sprayed trees. The average number of nuts per pound from the different treatments as shown in Table 4 was as follows: Bordeaux mixture 69.5, Karbam White 72, Zerlate, 83.9, and the unsprayed control, 86.C.

Discussion and summary

Certain differences in the results from the fungicide sprays applied to the Orangeburg and Edisto plots were striking. Bordeaux mixture was effective in controlling scab at both locations; however, at Orangeburg, Bordeaux-sprayed nuts showed many split shells and were not as large as those from the Zerlate plots. At the Edisto Station, Zerlate showed very poor control of scab in contrast to the effective control obtained at Orangeburg. It is suggested that this difference in control was due, in part, to the heavier rainfall at the Edisto Station. It is believed that the difference was associated with the poorer sticking qualities of

Zerlate as compared with Bordeaux mixture. In addition, one should consider the possibility of variation in the strains of the scab organism at the two locations.

The number of pecans per pound did not seem to be correlated with the amount and severity of scab infection. Several factors may have been important, such as time and degree of infection, in relation to stage of nut development. Moisture and temperature during the growing season are also important. Control of scab on Schley and other scab-susceptible varieties is important, but unless coordinated with improved orchard management and proper fertilization, continuing yields of high quality pecans cannot be expected.

The results of this experiment suggest the following:

1. Bordeaux mixture is an effective fungicide for the control of pecan scab.
2. At the Orangeburg plots Copper-A, Zerlate, and Parzate gave good control of the scab disease.
3. Zerlate appeared to possess poorer sticking qualities than Bordeaux Mixture.
4. Rainfall during the growing season is of primary importance in relation to the development of the scab fungus.

BOTANY AND HORTICULTURAL DEPARTMENTS, EXPERIMENT STATION, CLEMSON COLLEGE, SOUTH CAROLINA

PEACH SPRAY EXPERIMENTS FOR BROWN ROT CONTROL IN SOUTH CAROLINA DURING 1948 [1,2]

H. H. Foster

Eight different sprays were evaluated in 1948 for the control of the brown rot [Monilinia fructicola] disease of peaches in the field, in storage, and during shipment. The following sprays were applied with a 4-nozzle boom at approximately 600 pounds pressure: (1) one blossom spray of liquid lime-sulfur followed by 7 applications of wettable sulfur; (2) 3 blossom sprays of liquid lime-sulfur followed by 6 applications of wettable sulfur; (3) 3 blossom sprays of liquid lime-sulfur followed by 7 applications of wettable sulfur; (4) 3 blossom sprays of Phygon X-L (dichloronaphthoquinone) followed by 7 applications of wettable sulfur; (5) no blossom spray, 2 applications of wettable sulfur, 4 applications of Phygon X-L, and one application of wettable sulfur; (6) no blossom spray, 2 applications of wettable sulfur, and 5 applications of Zerlate (zinc dimethyl dithiocarbamate) [ziram]; (7) no blossom spray, 2 applications of wettable sulfur, and 5 applications of Parzate (zinc ethylene bisdithiocarbamate [zineb]; (8) no blossom spray, 2 applications of wettable sulfur, and 5 applications of Zerlate-Parzate in a 1:1 ratio; (9) wettable sulfur (6 to 7 applications) applied with a Speed-sprayer according to accepted local orchard practice. Each spray treatment (except #9) was applied to 10 trees distributed at random in a block of 12-year old trees of the Elberta variety located nearing Gramling, South Carolina. The dates of application of the several sprays and the concentrations of the fungicides used are shown in Table 1.

Arsenate of lead, used as the insecticide, induced some foliage injury in the form of spray burn and "shot-hole". Phygon X-L (treatment 5) after two cover sprays, induced moderate chlorosis of foliage and slight leaf drop; also the surface of many fruits appeared darkened and streaked. Consequently, the concentration of Phygon X-L was reduced to 1/2 lb/100 gallons of water for the 3rd and 4th cover sprays, which were followed by wettable sulfur as a preharvest spray. Both Zerlate and Parzate in treatments 6, 7, and 8 induced slight foliage chlorosis; consequently, the concentration of the fungicides for the last three cover sprays was reduced to 1 1/2 lbs./100 gallons. No definite fruit injury was observed from the use of Zerlate, Parzate, or the combination Zerlate-Parzate spray.

Apparently very little fungus infection had taken place during the blossom period, since only an occasional infected flower was observed.

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[1] Shipping tests were in cooperation with M. A. Smith and G. B. Ramsey of the U. S. Department of Agriculture, Chicago, Illinois.

[2] Acknowledgment is made to E. I. du Pont de Nemours and Co., Inc.; and to United States Rubber Company, Naugatuck Chemical Division, for furnishing certain fungicides used in these experiments.

Table 1. Fungicides used in experimental spray plots.[a]

Treatment No.	Time of Spraying and Fungicides Applied to Peach Trees				
	Blossom sprays and dates of applications			Petal fall 3-25	Calyx drop 4-15
	1st 3-18	2nd 3-20	3rd 3-22		
1	Liquid lime sulfur	-	-	Wettable sulfur $ZnSO_4$ Lime	Wettable sulfur $ZnSO_4$ lime
2	"	Liquid lime sulfur	Liquid lime sulfur	"	"
3	"	"	"	"	"
4	Phygon X-L	Phygon X-L	Phygon X-L	"	"
5	None	None	None	"	"
6	"	"	"	"	"
7	"	"	"	"	"
8	"	"	"	"	"

[a] see page 474 for explanation.

Table 1. Fungicides used in experimental spray plots.[a] (Continued)

Treatment No.	Time of Spraying and Fungicides Applied to Peach Trees				
	1st cover 4-26	2nd cover 5-10	3rd cover 5-31	4th cover 6-18	5th cover 7-6
1	Wettable sulfur $ZnSO_4$ lime	Wettable sulfur	Wettable sulfur	Wettable sulfur	Wettable sulfur lime
2	"	"	"	"	Lime
3	"	"	"	"	Wettable sulfur and lime
4	"	"	"	"	"
5	Phygon X-L and lime	Phygon X-L	Phygon X-L	Phygon X-L	"
6	Zerlate and lime	Zerlate	Zerlate	Zerlate	Zerlate and lime
7	Parzate and lime	Parzate	Parzate	Parzate	Parzate and lime
8	Zerlate and Parzate and lime	Zerlate and Parzate	Zerlate and Parzate	Zerlate and Parzate	Zerlate and Parzate and lime

[a] see page 474 for explanation.

[a] Concentration of spray materials used (Table 1 concluded):

I. Fungicides used
- A. Liquid lime sulfur, 1 gal. to 100 gal.
- B. Phygon X-L, 1 lb. to 100 gal. (blossom spray)
- C. Wettable sulfur, 6 lbs. to 100 gal.
- D. Zinc sulfate, 4 lbs. to 100 gal.
- E. Spray lime, 8 lbs. to 100 gal.
- F. Phygon X-L, treatment-5, 2 applications (4-26 & 5-10) 1 lb. to 100 gal., last 2 applications (5-31 & 6-18) 1/2 lb. to 100 gal.
- G. Zerlate, treatment-6, 2 applications (4-26 & 5-10) 2 lbs. to 100 gal.; last 3 applications (5-31, 6-18, & 7-6) 1 1/2 lbs. to 100 gal.
- H. Parzate, treatment-7, 2 applications (4-26 & 5-10) 2 lbs. to 100 gal.; last 3 applications (5-31, 6-18, & 7-6) 1 1/2 lbs. to 100 gal.
- I. Zerlate and Parzate, treatment-8, 2 applications (4-26 & 5-10) 1 lb. of Zerlate and 1 lb. of Parzate to 100 gal.; last 3 applications (5-31, 6-18, & 7-6) 3/4 lb. each of Zerlate and Parzate to 100 gal.

II. Insecticides
- A. Arsenate of lead (acid) 2 lb. to 100 gal., used in petal-fall application (3-25) for all treatments, also in calyx drop (4015), 1st cover (4-26) and 5th cover (7-6). Lead arsenate was omitted in 2nd, 3rd, and 4th cover sprays (5-10, 5-31, and 6-18).
- B. D.D.T., 2 lbs. of a 50% concentration to 100 gal. Used in all applications for 3rd and 4th cover (5-31, and 6-18).

At a preliminary examination of peach fruits preceding harvest, on July 19, an occasional brown rot-infected fruit was observed on only 7 trees out of a total of 80. On July 24, peaches from the spray treatments were harvested for shipping and storage tests. After grading and packing, part of the peaches were loaded for railway shipment to Chicago. In addition, 2 baskets from each spray treatment were placed in storage at Clemson College. One basket from each treatment was stored for 6 days at low temperature (36-45°F.), followed by 3 days at room temperature (approximately 75-85°F.), while the other basket was kept at room temperature for 4 days.

On arrival in Chicago, July 28, the baskets were placed at a room temperature of 75-85°F. Final inspection was made on August 1. Brown rot was of commercial importance only on fruit receiving the following 4 treatments: Nos. 2, 5, 7, and 8, (Table 2).

Table 2. Effectiveness of eight sprays in the control of brown rot of peaches during 4 days in transit and 4 days in storage at room temperature at Chicago.[a]

Treatment No.	Spray used	Number of peaches examined	Percent decay	
			Top layer	Bottom layer
1	Liquid lime sulfur, 1 blossom spray. Wettable sulfur, 7 applications.	414	2.7	1.5
2	Liquid lime sulfur, 3 blossom sprays. Wettable sulfur, 6 applications.	356	11.9	16.9
3	Liquid lime sulfur, 3 blossom sprays. Wettable sulfur, 7 applications.	436	2.7	0.5
4	Phygon X-L, 3 blossom sprays. Wettable sulfur, 7 applications.	406	1.4	2.1
5	No blossom spray Wettable sulfur, 2 applications Phygon X-L, 4 applications Wettable sulfur, 1 application	375	4.5	3.3
6	No blossom spray Wettable sulfur, 2 applications Zerlate, 5 applications	411	1.4	2.5
7	No blossom spray Wettable sulfur, 2 applications Parzate, 5 applications	419	4.5	9.1
8	No blossom spray Wettable sulfur, 2 applications Zerlate - Parzate, 5 applications	408	21.5	15.4

[a] Temperature in room varied between 75° and 85°F. during storage period.

Table 3. Results of cold storage tests of sprayed peaches at Clemson College.

Treatment No.	Spray used	Number of days at 36-45°F.	Number of days at 75-85°F.	Number of peaches examined	Percent brown rot
1	Liquid lime sulfur, 1 blossom spray. Wettable sulfur, 7 applications	6	3	194	0.5
2	Liquid lime sulfur, 3 blossom sprays. Wettable sulfur, 6 applications	6	3	193	4.1
3	Liquid lime sulfur, 3 blossom sprays. Wettable sulfur, 7 applications	6	3	176	1.7
4	Phygon X-L, 3 blossom sprays. Wettable sulfur, 7 applications	6	3	195	0.0
5	No blossom spray. Wettable sulfur, 2 applications; Phygon X-L, 4 applications; Wettable sulfur, 1 application	6	3	177	0.0
6	No blossom spray. Wettable sulfur, 2 applications; Zerlate, 5 applications	6	3	172	0.0
7	No blossom spray. Wettable sulfur, 2 applications; Parzate, 5 applications	6	3	186	0.0
8	No blossom spray. Wettable sulfur, 2 applications; Zerlate-Parzate, 5 applications	6	3	183	2.7
9	Wettable sulfur (6 to 7 applications, applied by Speed-sprayer (Commercially sprayed orchard)	6	3	190	11.0

Table 4. Results of tests of sprayed peaches stored at room temperature at Clemson College.[a]

Treatment No.	Spray used	Number of days at 75-85°F.	Number of peaches examined	Percent brown rot
1	Liquid lime sulfur, 1 blossom spray Wettable sulfur, 7 applications	4	182	1.0
2	Liquid lime sulfur, 3 blossom sprays Wettable sulfur, 6 applications	4	167	7.7
3	Liquid lime sulfur, 3 blossom sprays Wettable sulfur, 7 applications	4	190	0.5
4	Phygon X-L, 3 blossom sprays Wettable sulfur, 7 applications	4	177	1.6
5	No blossom spray. Wettable sulfur, 2 applications; Phygon X-L, 4 applications; Wettable sulfur, 1 application	4	179	1.1
6	No blossom spray. Wettable sulfur, 2 applications; Zerlate, 5 applications	4	186	2.1
7	No blossom spray. Wettable sulfur, 2 applications; Parzate, 5 applications	4	188	6.3
8	No blossom sprays. Wettable sulfur, 2 applications; Zerlate-Parzate, 5 applications	4	182	13.1
9	Wettable sulfur, 7 applications Applied by Speed-sprayer (Commercially sprayed orchard)	4	192	19.2

[a] Temperature in room varied between 75-85°F. during storage period.

The peaches held in cold storage for 6 days at Clemson College and then ripened for 3 days at room temperature (Table 3), showed very little brown rot after this period. Peaches held only at room temperature showed, in most treatments, an increase in brown rot. Treatment No. 2 showed 7.7 percent brown rot, while treatment No. 3 showed only 0.5 percent, (Table 4). The additional sulfur spray in treatment No. 3 gave added control. The combination of Zerlate and Parzate did not give satisfactory control. Fruit from the commercially sprayed plot (No. 9, sprayed with wettable sulfur) showed approximately 20 percent brown rot infection. The difference in brown rot control between the commercially sprayed sulfur plot and the experimentally sprayed sulfur plot appeared to be due to the better coverage obtained through experimental spraying.

Conclusions

1. The results of the shipping (railway) experiment indicate that brown rot was of commercial importance only on fruit from 4 of the 8 plots: treatment No. 2, consisting of 3 blossom sprays with liquid lime-sulfur and followed by 6 applications of wettable sulfur; treatment No. 5, without blossom sprays but with 2 applications of wettable sulfur, 4 applications of Phygon X-L, and one application of wettable sulfur; treatment No. 7 without blossom sprays but with 2 applications of wettable sulfur, followed by 5 applications of Parzate; treatment No. 8 without blossom sprays, but with 2 apolications of wettable sulfur, followed by five applications of Zerlate-Parzate, used at a ratio of 1:1.

2. In the cold storage tests, brown rot was of commercial importance in the case of the following two treatments: treatment No. 2, consisting of 3 blossom sprays of liquid lime-sulfur followed by 6 applications of wettable sulfur; treatment No. 9, wettable sulfur applied by means of a Speed-sprayer (commercially sprayed plot).

3. In peaches held continuously at room temperature (75-85°F.), there was an increase, during storage, of brown rot symptoms on fruit from the following four treatments: No. 2, 3 blossom sprays of liquid lime-sulfur followed by 6 applications of wettable sulfur; No. 7, without blossom sprays but with 2 applications of wettable sulfur followed by 5 applications of Parzate; No. 8, without blossom sprays but with 2 applications of wettable sulfur followed by 5 applications of Zerlate-Parzate used at a ratio of 1:1; No. 9 (commercial plot), sprayed with wettable sulfur applied by a Speed-sprayer.

4. Of the sprays used, in the experimental plots, 7 applications of wettable sulfur gave excellent brown rot control; Zerlate and Phygon X-L gave good control of brown rot, but were not superior to wettable sulfur; and Phygon X-L, at the concentration used, induced a dark streaking on most of the fruit, but the discoloration did not extend into the flesh.

DEPARTMENT OF BOTANY AND BACTERIOLOGY, EXPERIMENT STATION, CLEMSON COLLEGE, CLEMSON, SOUTH CAROLINA

SPRAY INJURY TO SOUR CHERRY PETALS DURING WARM WEATHER

D. Petersen and D. Cation

In the three years, 1946, 1947, and 1948, brown rot (Monilinia fructicola) blossom blight of cherry has been severe in many orchards in southwestern Michigan, particularly in Berrien County. In this county actual counts on Montmorency cherry showed from 40 to 60 percent of the blossoms blighted and on sweet varieties from 10 to 100 percent, varying with the season, location, and the amount of inoculum present.

As serious blossom blight of sour cherry was previously unknown, few growers applied preventive sprays during these years. However, with the disease becoming an annual occurrence in this area, most growers applied pre-bloom and in-bloom sprays in 1949.

Previous spray experiments by Cation (unpublished) and reports from the growers showed that liquid lime sulfur, 2 gallons in 100, applied in partial or early bloom discolored cherry petals, turning them brown; but reduction in fruit set was not noticeable. Because of the severe browning of the petals experienced, lime sulfur was not advised for blossom application. However, delayed pre-bloom and in-bloom sprays of wettable sulfurs, carbamates, or low-soluble coppers or sulfur dusts were suggested for 1949 applications.

Coincident with the opening of cherry blossoms in the Sodus (Berrien County) area on May 3, 1949, there developed a period of extremely warm weather. Maximum temperatures in the Sodus area ranged from 88° to 92°F. during the period of May 3 to May 6 inclusive.

Sprays of wettable sulfur (4-6 pounds per 100 gallons), sulfur paste (4 pounds), Kolofog (6 pounds), and Fermate (1 1/2 pounds) applied during this period turned the petals brown, in some instances within four hours after the spray was applied. The browning was most severe and more quickly apparent where application was made during the hours of 10 A. M. to 4 P. M. Those sprays applied later than 4 P. M. showed less severe browning. It was also readily noticed that the north side of the trees was less affected.

On May 7 an attempt was made to evaluate the injury resulting from the different spray materials, but it was disclosed that differences between materials were not so important as the time of day the application was made. However, unsprayed trees were showing petal browning by this time, although to a lesser extent than sprayed trees.

In order to determine whether the injury to the petals had caused a decrease in the fruit set, a number of blooms were individually marked and observed for a 10-day period. The counts on fruit set were not con-

clusive, as a result of late frosts which reduced fruit set in the vicinity from 30 to 90 percent, depending on orchard location. In the orchard where counts were made, the blossoms injured by frost were recorded separately. The remaining blossoms set 98.5 percent fruit, indicating very little if any loss resulting from the petal browning by sprays.

In Ottawa County (50 miles north) where the bloom period for sour cherries was five to seven days later, no browning was observed or reported from the use of sprays in bloom. It was apparent from this and the other facts presented that extremely warm weather at a critical period was the major factor in aggravating the injury of cherry petals by sulfur-containing sprays.

In Berrien County some varieties of peach were in bloom during the critical period for cherry, but where wettable sulfurs or even 2 gallons in 100 of liquid lime sulfur were applied, examination disclosed no injury to peach petals.

MICHIGAN STATE COLLEGE, EAST LANSING, MICHIGAN

THE OCCURRENCE OF DISEASES OF SMALL GRAINS IN VIRGINIA IN 1949

Curtis M. Roane

Numerous diseases occur on small grains in Virginia each year and cause considerable loss. A few of these diseases, such as leaf and stem rusts, powdery mildew, and the smuts, exact the greatest toll and are severe each year. Other diseases are present but cause little damage and are of only local concern. The diseases listed below occurred on the respective crops in 1949.

Wheat diseases. Powdery mildew (Erysiphe graminis) and leaf rust (Puccinia rubigo-vera tritici) were generally prevalent in the Coastal Plains and Piedmont areas. Both diseases appeared early and caused considerable damage. A mild winter and early spring were conducive to the development of mildew, which caused severe damage to wheat in the tillering stage, especially in the Piedmont area. In the Appalachian Highlands, mildew and leaf rust appeared late and developed moderately. Stem rust (P. graminis tritici) was less severe than usual. Damage was severe only in the immediate vicinity of barberries. This light injury was attributed to cool, dry weather at the time aeciospores were spreading from barberries. Subsequently, dews were light and rains, favoring secondary spread, came after wheat had reached the hard dough stage. At Blacksburg, stem rust became 100 percent severe in a disease nursery artificially inoculated, while uninoculated susceptible varieties 150 yards away developed a severity of only 1 percent or less by harvest time.

Loose smut (Ustilago tritici) generally was held in check by the use of the resistant varieties, Vahart and Thorne, and by the use of smut-free certified seed; however, in some fields of Fulcaster, Redhart, Hardired, and VPI 131, smut caused losses as high as 5 percent, but such cases were rare. Scab (Gibberella spp.) was generally present but apparently not severe. Glume blotch (Septoria nodorum) and anthracnose (Colletotrichum graminicolum) were prevalent but caused no apparent loss. Meadow nematode damage was found near Chilhowie. Take-all (Ophiobolus graminis) occurred on one farm near Amelia. Frost damage as reported by Livingston and Swinbank[1] was observed in Thorne wheat in Montgomery County.

Farmers have been concerned about the appearance of blackened heads scattered through wheat. Plants or culms which had died prematurely were covered with Dematiaceous fungi such as Alternaria, Cladosporium, Epicoccum, and Hormodendron. Such darkened plants were conspicuous and caused much concern. The death of these plants may have been caused by insects and root, crown, or stem diseases. In general, sooty molds are not the cause of losses but only the signal that other entities may be active. For example, the presence of a large patch of sooty mold in the field led to the discovery of take-all. The sooty molds continue to develop after grain is ripe and lead to a general darkening of the straw and heads.

Oat diseases. Leaf blotch (Helminthosporium avenae), crown rust (Puccinia coronata), and the smuts (Ustilago avenae and U. kolleri) were prevalent. Crown rust attacked all oats not having Victoria resistance. In the Coastal Plains and Piedmont, crown rust appeared early and was very severe, but in the Appalachian Highlands it appeared very late and caused little damage. The smuts were very severe in some fields. By actual count, one farmer's field had 42 percent smutted panicles. Victoria hybrids of winter type suffered little damage from Victoria blight (H. victoriae). Stem rust (P. graminis) caused little damage to oats. Anthracnose (Colletotrichum graminicolum) was prevalent but not damaging.

A severe yellowing in experimental nurseries and a few commercial fields caused some concern. Severely affected plants were stunted, produced lemon-yellow flag leaves, and yielded poorly. Helminthosporium avenae was usually severe in these fields and was accompanied by foot rot (Fusarium avenaceum), as well as hosts of nematodes in the roots, crowns, and stems. Extreme differences among varieties were noted.

Barley diseases. Loose smut (Ustilago nuda), leaf rust (Puccinia hordei), powdery mildew (Erysiphe graminis), and spot blotch (Helminthosporium sativum) were generally prevalent. Barley made a rapid growth

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[1] Livingston, I. E. and J. C. Swinbank. Two types of late spring frost injury to winter wheat. J.A.S.A. 39: 536-544. 1947.

in the fall and was attacked by leaf rust and powdery mildew during that time. As winter approached and temperatures dropped, both diseases became less and less active but at any time during the winter their presence could be detected by removing plants to the greenhouse, where active mildew and rust appeared in much less time than would have been required had the leaves not already been infected. Consequently, these latent infections permitted rapid spread of leaf rust and mildew when temperatures became favorable in the spring. Both diseases can be serious in Virginia. The recommended variety, Wong, is resistant to mildew but highly susceptible to leaf rust and loose smut.

Scald (Rhynchosporium secalis) appeared in several fields of the variety Wong, but caused little damage. Stripe (Helminthosporium gramineum) was not damaging. In 1948, however, a 250-acre field of Wong in Charles City County, which had been planted in December 1947, was completely destroyed by stripe. A 400-acre field on the same farm, planted in September 1947, was not affected. Neither seed lot was treated.

DEPARTMENT OF PLANT PATHOLOGY AND PHYSIOLOGY, VIRGINIA AGRICULTURAL EXPERIMENT STATION

BARLEY AND WHEAT MOSAIC IN OKLAHOMA

D. F. Wadsworth[1]

In May of 1948 Dr. K. Starr Chester[2] found a single barley plant in a row of a Composite Hybrid Selection that showed striking mosaic symptoms. This barley plant was found growing in the breeding nursery of the Agronomy Department at Stillwater, Oklahoma. Since this single plant was so characteristic of the symptoms of wheat mosaic, it aroused considerable interest, and it was turned over to the writer for investigation.

Barley leaf tissue from the diseased plant was carefully selected and macerated. The expressed juice, with carborundum, was used to inoculate 50 varieties of barley, and produced symptoms similar to those of the original plant in many of the varieties tested.

The barley mosaic virus was easily transmitted and it has been kept in continuous culture since its discovery. However, for comparison, it was not possible to keep wheat mosaic in continuous culture because wheat

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2 Formerly head of the Botany and Plant Pathology Department at Oklahoma A. & M. College, and now with Battelle Memorial Institute, Columbus, Ohio.

did not survive the high summer temperatures during 1948 in Oklahoma.

During the past year investigation has been undertaken in an attempt to establish the relationship, if any, between wheat mosaic and the mosaic found on the single barley plant. On the basis of greenhouse tests, this barley mosaic appears to be different from wheat mosaic. However, further tests are in progress and these results will be reported at a later date.

During the growing season of 1948-49 no mosaic, on either wheat or barley, was reported in Oklahoma. However, wheat mosaic was observed in several winter wheat plots during the spring season of 1948 at the Oklahoma A. & M. College Experiment Station near Stillwater.

OKLAHOMA AGRICULTURAL EXPERIMENT STATION

A NEW STRAIN OF RUST CAUSED LOSSES TO BEANS ON THE EASTERN SHORE OF MARYLAND

L. O. Weaver and C. P. Marcus, Jr.

Bean Rust (*Uromyces phaseoli typica*) has caused considerable losses in Kent County on the Eastern Shore of Maryland during the late summer and fall months of this year. The disease first came to our attention from this area in September 1948. In both years, beans planted after mid-July were severely diseased and the crop a total loss. Losses only occurred on these late plantings. Whether the disease is present earlier in the year is not known. Prior to 1948, beans were not grown in this area on a commercial scale. Bean rust has also occurred on late plantings this year in Baltimore County. For the past ten years in Maryland, this disease has been recorded as a trace with no serious local losses.

In Kent County, the varieties Black Valentine and Tendergreen were grown. Uredo sori were very abundant on the primary leaves and stems. Rust spread to all the foliage which turned brown and dry and then dropped from the plants. Losses were caused either by the failure of the plants to set a crop or the green beans produced by defoliated plants were of poor quality and unfit for fresh market or canners.

A new physiologic race of the bean rust fungus is indicated by a preliminary test using the seven differential varieties as reported by Harter and Zaumeyer.[1]

The bean fields are often disced and wheat planted in September or October. Many volunteer bean plants were observed in the wheat. These

[1] Harter, L. L. and W. J. Zaumeyer. Differentiation of physiologic races of *Uromyces phaseoli typica* on bean. Jour. Agr. Res. 62: 717-782. 1941.

heavily rusted plants are not destroyed in the spring.

The overwintering of this pathogen in Maryland is under further study.

UNIVERSITY OF MARYLAND, COLLEGE PARK, MARYLAND

THE OCCURRENCE OF VASCULAR BROWNING OR INTERNAL BROWNING IN TOMATOES FROM PENNSYLVANIA AND NEW YORK

Bernard A. Friedman[1]

A disease of tomatoes, characterized by an internal brown discoloration and called vascular browning or gray wall, has been reported recently by Conover from Florida.[2] An apparently similar condition called internal browning has been described by Haenseler[3] from New Jersey, where it has been associated with tobacco-mosaic virus by Holmes.[4]

Samples of tomatoes affected with internal browning were shown to the writer by Dr. Haenseler. The purpose of the present note is to report that fruit with identical symptoms were sent to the New York Market Pathology Laboratory by Federal-State inspectors in 1948 and 1949 from crops grown in Pennsylvania, New York, Florida, and New Jersey. The specimens from Pennsylvania and New Jersey were cannery tomatoes, those from Florida were green-wrap fruit, and those from New York were market tomatoes.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES

A DESTRUCTIVE DISEASE OF TOMATOES CAUSED BY RUSSET MITES IN EAST TEXAS

P. A. Young

Greenhouse tomatoes, transplanted into a field of the Tomato Laboratory at Jacksonville on April 2, 1949, showed browning and drying of the lower leaves without wilting, and brownish-green or brown discoloration of the epidermis of the bases of the stems on May 25. Glandular

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[1] Associate Pathologist, Div. of Fruit & Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, & Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

[2] R. A. Conover. Vascular browning in Dade County, Florida green-wrap tomatoes. Pl. Dis. Reptr. 33: 283-284. 1949.

[3] C. M. Haenseler. Internal browning of tomatoes in New Jersey. Pl. Dis. Reptr. 33: 336-337. 1949.

[4] F. O. Holmes. Association of strains of tobacco-mosaic virus with internal browning in tomatoes. Pl. Dis. Reptr. 33: 338-339. 1949.

hairs became brown, rachises curled downward, and many leaflets showed hypophyllous silvering. Dr. H. G. Johnston, Entomologist of the Texas Agricultural Experiment Station at College Station, identified the cause of these tomato symptoms as Phyllocoptes destructor Keifer. These are clavate yellowish mites 90 to 160 by 45 microns. Relatively few mites per plant damage it severely. The mites spread rapidly 1/2 mile over 6 fields, presumably by wind and animals, and decreased tomato yields 25 to 75 percent. Two tomato fields became brown due to russet mites in June and July. The mites damaged the plants of Lycopersicon esculentum, L. peruvianum, and L. hirsutum f. glabratum. Dusting sulfur with its fumes in hot dry weather controlled russet mites in a tomato field that was dusted every 3 weeks with 25 to 50 lbs. of sulfur per acre. It is unknown how russet mites came to Texas. References describe russet mites (1), control tests with sulfur (2,3) and occurrence in Texas (4). All of the tomato plants at the Tomato Disease Laboratory were destroyed mechanically to try to eradicate the russet mites.

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2. Wilcox, J. and J. C. Elmore. The control of the tomato fruitworm, the tomato pin worm, the tomato russet mite, and horn worms. U.S.D.A. Bur. Ent. & Plant Quar. E-539. 1943.
3. Wilcox, J. and A. F. Howland. Results of field experiments with DDT against insects affecting tomatoes in southern California. U.S.D.A. Bur. Ent. & Plant Quar. E-699. 1946.
4. Young, P. A. Some diseases of peach, tomato, and watermelon in East Texas. Plant Disease Reporter 33: 389-391. 1949.

TOMATO DISEASE LABORATORY, JACKSONVILLE, TEXAS

✓ COMMON NAMES FOR FIVE FUNGICIDAL CHEMICALS

The following statement is excerpted from an announcement by S. A. Rohwer of the U. S. Bureau of Entomology and Plant Quarantine, Chairman of the Interdepartmental Committee on Pest Control:

The Subcommittee on Fungicide Nomenclature of the American Phytopathological Society, cooperating with the Interdepartmental Committee on Pest Control, has selected common names for five commercially-available fungicidal chemicals which are useful in the control of various destructive plant diseases. Information concerning the names, the approval and acceptability of their use as coined common names for these specific chemi-

cals is filed with the Trade-Mark Division of the United States Patent Office, Department of Commerce, to preempt the use of the names as trade marks. Notices of the selection of the common names and definitions are being forwarded to officials and agencies in other countries.

The selection of the common names was initiated by the Subcommittee on Fungicide Nomenclature of the American Phytopathological Society and has been adopted by them on behalf of the Society. This carries with it the acceptability of the names for use by that Society and its publications. The Interdepartmental Committee on Pest Control has consulted with various Governmental agencies and with collaborators. Contacts with various agencies and collaborators have indicated that there is no objection to the selected names and that they are considered acceptable for use. Those consulted include the Committee on Therapeutic Agents and Appliances of the American Veterinary Medical Association; American Medical Association; Association of Economic Poisons Control Officials; American Chemical Society through the Editor of CHEMICAL ABSTRACTS; and the following from the Department of Agriculture--Insecticide Division of the Production and Marketing Administration and the Bureau of Plant Industry, Soils, and Agricultural Engineering, which unit advises that the names will be acceptable in connection with publications that may be issued by that Bureau.

The coined common names and designations are:

Ferbam for the fungicidal chemical, ferric dimethyl dithiocarbamate.

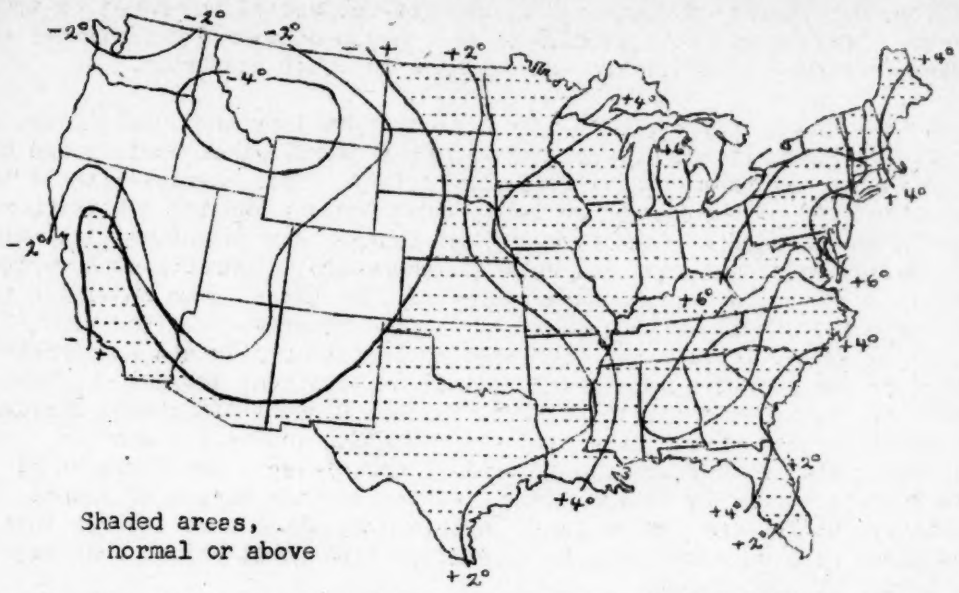
Ziram for the fungicidal chemical, zinc dimethyl dithiocarbamate.

Nabam for the fungicidal chemical, disodium ethylene bisdithiocarbamate.

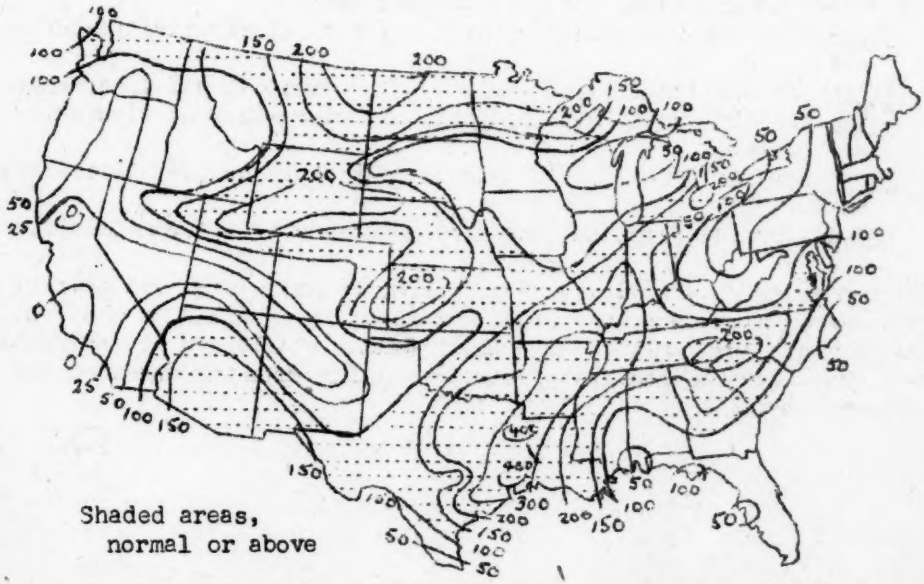
Zineb for the fungicidal chemical, zinc ethylene bisdithiocarbamate.

Thiram for the fungicidal chemical, tetramethylthiuram disulfide.

The foregoing five words (ferbam, ziram, nabam, zineb, and thiram) are coined common names for specific chemicals. They should be used as common names. When written, the first letter should not be capitalized except where such capitalization is in keeping with the accepted use for common names.



Map I. Departure of mean temperature from normal for October, 1949



Map II. Percentage of normal precipitation for October, 1949

OCTOBER WEATHER

(From U. S. Department of Commerce, Weather Bureau, Weekly Weather and Crop Bulletin for the week ending November 8, 1949)

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